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NOTES ON THE HABITS OF CERTAIN CRAWFISH.

BY CHARLES C. ABBOTT, M.D.

IN the course of a day's fishing during the past month of September, my companion and myself caught a large number of those lobster-like crustaceans, known everywhere as "Crawfishes;" and by zoologists, as either *Cambarus* or *Astacus*, the former differing from *Astacus* in having a more elongated body, "by the absence of the gill on the fifth pair of legs," and other slight differences, not noticeable except upon careful examination.

The crawfishes found in New Jersey all belong to the genus *Cambarus*; and of this genus, certainly three species, viz., *Cambarus acutus* Girard, *Cambarus affinis* Say, and *Cambarus Bartonii* Fabricius, are found either in the streams and ditches near, or in the Delaware River, at Trenton, New Jersey.

It is difficult to say which of the three species is the most abundant in the general locality we have named, inasmuch as they seem to prefer different streams; one being a plant-loving, one a stone-haunting, and the third, a mud-frequenting species. In their respective haunts, each is apparently as numerous as is either of the others in their chosen home.

During the past month (September), as a result of a thorough examination of many small streams, as well as of the Delaware River itself, we have found the *Cambarus acutus* to frequent running streams, which have masses of vegetation growing in them, the animal in question resting upon the plants, usually near the surface of the water. We have found since our collecting excursions, on carefully approaching clear, running streams, such as just mentioned, that this crawfish is to be seen resting on the plants always with the head directed down stream. If disturbed, they would dart backwards down to the roots, apparently, of the plant upon which they were sitting. After a lapse of about ten minutes they would return to their former resting-place creeping up the plant down which they had so suddenly darted tail foremost.

The *Cambarus affinis* is apparently the river species of this locality. We have been able to find it, as yet, only in the Dela-

ware River, usually frequenting the rocky bed, but also, in fewer numbers, on the mud-bottomed portions of the river. They are usually found resting under flat stones, well out from the banks of the stream, where the water is of considerable depth. Wherever the vegetation is dense, we have failed to find them; nor have we seen anything to indicate that it is a "burrowing" species.

Dr. Hagen, in his "Monograph of the North American Astacidae," which work we have followed exclusively in identifying the specimens we have collected, says, on page 62, "The *Astacus limosus* Rafinesque (Amer. Monthl. Mag., t. 2, p. 42) from the muddy banks of the Delaware" is apparently the same species as *Cambarus affinis*. While we have no reason, really, to doubt the correctness of this assertion, we may say that the specimens we have collected during September were none of them from the "muddy banks," but from the *bed* of the river; although in such banks we found many crawfish, of a very different species, as we shall see.

The *Cambarus Bartonii*, it appears to us, is the one burrowing species of this locality. We have found in the deep ditches, with precipitous, muddy banks, a medium sized crawfish, that in most respects, accords with the species called *Cambarus Bartonii* Fabr., by Dr. Hagen, on page 75 of his Monograph.

We have purposely said "in most respects," inasmuch as there is a considerable range of variation between the many examples that we have collected. Dr. Hagen says of this crawfish it "is the most variable species; as yet I cannot find stable and constant characters for dividing them into three or four species, as Mr. Girard has done."

It is this species, we doubt not, that Dr. Godman found near Philadelphia, and has referred to, as follows, in his "Rambles of a Naturalist," which we find printed with the second volume of his "American Natural History," third edition: Philad., 1842. Dr. Godman says,— "I now returned to the little brook and, seating myself on a stone, remained for some time unconsciously gazing on the fluid which gushed along in unsullied brightness over its pebbly bed. Opposite to my seat was an irregular hole in the bed of the stream into which, in an idle mood, I pushed a small pebble with the end of my stick. What was my surprise, in a few seconds afterwards, to observe the water in this hole in motion, and the pebble I had pushed into it gently approaching the surface. Such was the fact; the hole was the dwelling of a stout

little crawfish or fresh-water lobster, who did not choose to be incommoded by the pebble, though doubtless he attributed its sudden arrival to the usual accidents of the stream, and not to my thoughtless movements. He had thrust his broad lobster-like claws under the stone, and then drawn them near to his mouth, thus making a kind of shelf; and as he reached the edge of the hole, he suddenly extended his claws, and rejected the encumbrance from the lower side, or down stream. Delighted to have found a living object with whose habits I was unacquainted, I should have repeated my experiment, but the crawfish presently returned with what might be called an armful of rubbish, and threw it over the side of his cell, and down the stream as before. Having watched him for some time while thus engaged, my attention was caught by the considerable number of similar holes along the margin and in the bed of the stream. One of these I explored with a small rod, and found it to be eight or ten inches deep, and widened below into a considerable chamber, in which the little lobster found a comfortable abode. Like all of his tribe, the crawfish makes considerable opposition to being removed from his dwelling, and bit smartly at the stick with his claws: as my present object was only to gain acquaintance with his dwelling, he was speedily permitted to return to it in peace."

There are some points in this pleasing description of the haunt of a burrowing crawfish that differ from the results of our own observations. It will be noticed that the principal description is of a "burrow" or hole in *the bed* of the stream, facing against the current. This is more in accordance with what we have noticed of the habits of *Cambarus affinis*, which species, however, appears merely to take shelter under stones; and the burrows of *Cambarus Bartonii*, so far as we have discovered them, have all been *in the banks* of the smaller streams and meadow ditches (and occasionally, a colony of burrows *in the river bank*, where peculiarly favorable), a little below the usual water line.

The crawfish that we have found inhabiting such burrows, located as we describe, besides showing anatomical specific differences, will thrive admirably, we find, in an aquarium, where the water is, of course, quiet; while both the others die very soon after being taken from their natural habitats. This fact, we think, is of itself quite sufficient to show a decided difference between a burrowing and a running water species, even if no anatomical variations could be traced.

Dr. Hagen refers to the quotation from Dr. Godman, speaking of the crawfish, of which the latter writes, as *Cambarus Diogenenes* Girard, and considers it to be the same as *C. Bartonii* Fabricius; although it seems to bear some resemblance to *C. obesus* Hagen, a southern and western species. One fact is certain, at least, that the specimens observed by Godman were in a stream near Philadelphia, a locality familiar to Girard. We have found no specimen about Trenton, New Jersey, that could be identified with *C. obesus* Hagen, although we have made very careful search, hoping to find more than the three species we have mentioned.

Crawfish are strictly omnivorous animals but, although excellent scavengers, do not feed wholly upon decayed animal and vegetable matters. We have frequently noticed that *C. Bartonii* in an aquarium breaks off the short stems of the common river-weed, and eats the main stem, after stripping it of its minute leaves. So too *C. affinis*, from beneath its sheltering flat stone, and *C. Bartonii*, in its safe burrow, will seize the minute young Cyprioids, that pass up and down near the stream in such myriads, ever and anon peeping into the various little indentations in the banks. Such little fish when once fairly caught by the big, but by no means clumsy, "hands" of a *Cambarus*, have no chance of escape, and are soon torn in pieces and devoured.

Etheostomoids, or "darters," that habitually rest upon the bottoms of the streams they frequent, will usually take shelter underneath a stone, if one be near, when they are disturbed either by larger fishes, or by man. When a crawfish happens to have taken up his abode under such a stone, it is seldom that the frightened "darter" escapes. Often have we seen the common *Boleosoma Olmstedii* take refuge as we have described and found, on examination, a *Cambarus* quietly resting underneath the stone, with the luckless "darter" in his claws.

Having had our attention particularly called to these crustaceans, during the past month of September only, we have, of course, noted nothing of their breeding habits; but the very great numbers of very small specimens half an inch to an inch and one half in length that we have found, seem to indicate that the animal is of slow growth during the first summer of its existence; and on the other hand, we have failed to find any specimens of *C. acutus* more than four inches in length, the maximum size being six and three-tenths inches, as given by Dr. Hagen.

Dr. Hagen mentions six specimens from Essex (Co.?) New Jersey, however, that were smaller than the above figures quoted from his work, being, to use his own words, "Long. corp. 3 ad 4 inch." He thinks it quite possible that these may "belong to a different species (viz., *Cambarus Blandingii*), a South Carolina form.

The young Cambari, in September, seem to be fully as active as the adults, but do not frequent any given class of localities, as they wander about the beds of streams, creeping forward in a slow, awkward manner, and swimming backwards, when disturbed, with wonderful rapidity.

It has seemed curious to us, that we have found no dead specimens of crawfish. In what manner their unattractive bodies are disposed of after death we cannot imagine. We have tried, too, in vain, to find out their enemies; but have failed to do so. We should judge that if at all preyed upon, it must be when they are but a few weeks old. But what becomes of their adult dead? Do they, as birds are asserted to do, seek some hidden nook? or do they dig their own graves deeply in the mud, preparatory to the approaching dissolution, which they feel is near at hand?

The precise number of species of this crustacean, inhabiting the streams of New Jersey, we do not doubt, will prove to be more than the three that we have mentioned; but as yet these are all that we can readily distinguish among the many dozens that we have gathered in our immediate neighborhood. The differences that mark these species, according to Dr. Hagen, are found to be coexistent with our separation of the specimens, in accordance with the different classes of localities where found; we can therefore scarcely think that there is any error in asserting that the crawfish found in the neighborhood of Trenton, New Jersey, are respectively, *Cambarus acutus*, *affinis* and *Bartonii*; the first, a plant-loving species: the second, a deeper water, stone-haunting form; the third, a burrower in the muddy banks of ditches, small streams and, occasionally, of the river itself.